

## Response to reviewer on pages 1-2, then to editor on page 3

We thank the reviewer for having agreed to review our manuscript a second time. We re-wrote section 4 in a way we consider much clearer, with one subsection per (explicitly stated) hypothesis. We also added more in-situ observations so that section 4 contains fewer suggestions and instead a majority of findings. We nevertheless modified the title, as recommended.

In the following, the reviewer's comment is highlighted with **bold fonts** and our response is in plain text.

**The manuscript has improved but I am still not convinced that the scientific results obtained are sound. Maybe, I have not fully understood the approach. I am confused by the structure and the presented example cases and graphs. Shouldn't the IR test be applied on the full time series, not only on the pre-defined polynya events?**

They are applied to the full time series. See section 3.2.

**The manuscript is not easy to read. The structure with some scientific motivation only in the discussion is not optimal. The hypothesis is not well introduced.**

We mention more clearly our hypotheses throughout the manuscript. In particular, we have entirely re-written section 4 to increase clarity.

**What can be inferred from the detectability about the causes?**

This is the topic of section 4. We have re-written this section to make the connection clearer.

**While the authors agree that it is difficult to investigate the causes with observational data alone they have this aim still prominently in the title of the manuscript. The abstract does not keep what the title promises. The results about the reasons are only very vague "could indicate upwelling of warm water, .. which could indicate a lead..", "may be caused". The strong title and the weak results are thus in contradiction, it remains a speculation about the causes.**

We have modified the title.

We added more in-situ observations to section 4 for our conclusions to be more robust. Two co-authors have been added to the manuscript who helped with these new analyses.

Bearing in mind the reviewer's comment on the previous version of the manuscript, we also conducted extra analyses that allowed us to compute correlations and actual quantifications, instead of the visual description of the original manuscript.

**The writing style has unfortunately not much improved. For example: why use adjectives like "painfully"? In the next sentence why use the word "warning"? Taken together this suggests that the polynya is something that could cause harm or danger.**

We see from the reviewer's comments that our sentences were misunderstood. We removed the words that the reviewer criticised.

**Important comments from reviewer 2 have not been considered.**

To the best of our knowledge, we have addressed all of reviewer 2's comments. Please indicate which comments you are referring to.

**It is unclear why navigation is used in the first sentence to motivate the study.**

We removed this word. There genuinely are plans for commercial exploitation of ice-infested waters, in particular of polynyas, but mentioning them is beyond the scope of this paper.

**I disagree with the statement that the Polynya re-appeared in 2016 for the first time in forty years. There was at least a report about the reappearance of the winter Weddell Polynya in 1994, Drinkwater (1998). And the halo of the reduced ice concentration over Maud Rise was very often visible before and well documented in the literature as described in the manuscript. Thus, if it is written "for the first time" the criteria has to be explained.**

What the reviewer describes is our entire section 3.1. We rephrased the introduction.

**Page 2**

**"SAR is a comparatively recent technology for sea ice observation, providing climate data only since the early 2000s" - Seasat provided SAR data already in 1978. What "climate" data sets have been derived from SAR? I don't know any.**

This sentence has been removed.

**Page 3**

**25 km resolution is the grid resolution of the product, not the spatial resolution of the sensor.**

We modified this sentence to avoid such confusion.

### Comments from the Editor

We thank the editor for their comments. We added their contribution to the acknowledgement section.

#### **Specific points;**

**All line numbers refer to the track change manuscript.**

**Abstract line 4: either "the cause of the opening is not yet determined" or "the cause of the opening is much debated".**

We rephrased.

**I would caution you not to use T3b, T4 and T5 in the abstract as this is jargon not many readers may understand.**

We removed references to T3b, T4 and T5 from the abstract

**Page 4 Line 124: "so not for us" is colloquial.**

We rephrased

**Page 6 line 134: "is only directly available"**

We rephrased.

**Page 6 line 165: "so-called" is colloquial.**

Here, sincerely, thank you. I had never been told that it was colloquial / negative. We removed it from the manuscript (and from the proposal we were about to submit when your comment reached us)

**Page 16 line 287: "could also be warm air"**

This sentence has been removed from the manuscript.

**line 298: "snow layer" duplicated**

This sentence has been removed from the manuscript.

**Page 19: line 398: "so it is more likely that the"**

We do not see which sentence this comment refers to – words, page and line numbers do not match.

**line 399, this sentence is awkward**

Likewise, we do not see which sentence this comment refers to – line 399 on page 21 is entirely crossed out and the surrounding sentence does not sound awkward. Could you please suggest an alternative?